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Selected traumatic factors and their impact on ill newborns in hospital conditions – part II. Pain and touch

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ABSTRACT

During hospitalisation an ill or prematurely born neonate is exposed to multiple environmental factors, including traumatic stimuli, such as overly frequent and intense touch, and severe pain related to caring, nursing, rehabilitation, and diagnostic-therapeutic activities. The exposure to traumatic touch and pain-generating activities can lead to serious, irreversible changes in the child's development.

It is also necessary to sensitise members of the medical team to the need of reducing a number of activities that are sources of stressful touch and pain. Care of the newborn should include regular pain assessment, the evaluation of procedural pain, and effective analgesic treatment using pharmacological and non-pharmacological methods.

Key words: newborn, pain, traumatic touch, hospitalisation.

INTRODUCTION

Ill or preterm newborns are likely to require specialist treatment involving the application of therapeutic and nursing procedures, which are inherently connected with frequent touching. Modernised hospital wards that apply modern technologies are characterised by a very high frequency of direct contact with patients. Apart from nursing care involving activities such as bathing, changing diapers, perineal care, feeding, correcting body alignment, and changing and adjusting bed linen and clothes, newborns may also require invasive procedures including: inserting a gastric probe, removing secretion from nasopharynx, cannulation, passive oxygen therapy, administering medicines by intravenous injections, changing dressing, medical examination, and specialist diagnostic examination including taking samples of biological material for further analysis. All these activities make up a great number of procedures associated with traumatic touch. A relationship can be observed between the deteriorating condition of newborns and a growing number of forms of treatment and examination involving painful procedures and touching the newborn more and more frequently, as much as 2-3 times an hour [1-3].

The objective of the study was to show how hospitalised newborns are affected by pain and traumatic touch resulting from diagnostic and therapeutic procedures performed by nursing staff.

TOUCH AND ITS EFFECT ON THE ORGANISM OF NEONATAL PATIENTS

The sense of touch develops as one of the first senses as early as in the seventh week of foetal life. An unborn human can sense touch while his or her mother or others caress the skin of the pregnant stomach. Touch receptors are located on the whole skin surface; however, they are most numerous on fingers, lips, and mouth [4].

Touch, especially the parents' therapeutic touch, has a positive influence on the psychophysical development of the newborn baby. Not only does it stimulate nervous system development but it also plays a crucial role in developing emotional, cognitive, and social functions and also provides newborns with a sense of security and calms them [5-10].

Positive forms of touch are commonly applied in nursing newborns who are hospitalised in intensive care wards. The therapy may consist of continuous, gentle touching (repeated three times a day in 10-20-minute sessions when one hand is held on a newborn's head and the other on its back and bottom), caressing, massaging, massaging accompanied by kinaesthetic and vestibular stimulation, and skin-to-skin care also known as kangaroo care. The skin-to-skin care introduced as the first form of direct contact between the newborns and their mothers has a significant impact on decreasing neonatal mortality, especially in the case of preterm and underweight newborns [11-14]. In skin-to-skin care babies are held naked against their mothers' or some other person's naked chest in an upright position and covered with a blanket or a cloth diaper. It is crucial that the baby's head is held in such a position that secures airway patency. The baby's legs should be spread in a frog-like position. Preterm and extremely underweight newborns should be positioned diagonally – with the baby's head lying on one breast and the body under the other one. The kangarooing person should hold one hand on the baby's back below the neck with the thumb stabilising the baby's lower jaw so that the head remains turned sideward, whereas the other hand should be put below the baby's bottom. Such a position provides the baby with a sense of security. Moreover, this method helps to start breastfeeding as soon as possible. It is recommended that skin-to-skin care start as early as possible and take place as often as possible. A single session should not last for less than 60 minutes [5, 11, 15] to avoid touching the baby too often while changing position and thus reducing the risk of stress. Skin-to-skin care should be accompanied by computer-assisted monitoring of the newborn's basic vital signs as well as controlling the position of an intubation tube, sensors, and vascular catheters [11]. Even mechanically ventilated newborns can safely benefit from skin-to-skin care provided that proper precautions are taken [16].

Beneficial effects of touching might also be obtained by massaging newborns. Massaging has a stimulating effect on nervous system development, improves blood circulation in internal organs, muscles, and skin, and stimulates proper breathing and peristalsis of digestive system. Moreover, it improves blood supply to tissues, improves breathing capacity and efficiency of digestive system, soothes baby colic, speeds up weight gain, and alleviates pain. Additionally, a massage develops in newborns an awareness of their own body, provides them with a sense of security, and teaches them how to perceive external stimuli [5, 7, 9, 17, 18]. Massaging also helps to reduce stress reactions resulting from specialist therapies. It may contribute to reducing the number and length of reactions such as crying, grimacing, yawning, or thumb sucking. It leads to quicker cardiopulmonary stabilisation and also, by reducing the level of catecholamines, affects newborns' reaction to stress [7, 17-20]. Lack of maternal stimulation or early isolation of newborns result in disorders involving the hypothalamic-pituitary-adrenal axis, which in turn leads to an increase in the baseline concentration of cortisol and, consequently, disorders in newborns' reactivity and difficulties in calming down after a stress reaction [9, 21, 22].

Unfortunately, touching connected with medical care frequently belongs to factors that have a destructive impact on newborns. It is followed by the baby's waking and crying, which leads to anxiety, sleep disorders, and a stress reaction involving various organ disorders such as cardiac arrhythmias (tachycardia and bradycardia), apnoea, hypoxia, deterioration of digestive system motility, and an increase in intracranial pressure. Moreover, prolonged exposure to stress-inducing touch might have far-reaching consequences leading to touch-related anxiety and pain, which, in turn, might result in isolation from society, withdrawal, and problems with expressing one's needs. Every therapeutic treatment that is considered routine from a medical point of view is perceived as a traumatic experience by newborns. It refers both to the physical aspect, because of accompanying pain and discomfort, and to the emotional one due to the anxiety and fear which follow [14, 23]. It must be taken into consideration that every newborn or infant has an individual reaction to stress, and the consequences of stress affecting neurohormonal and physiological functioning determine the trajectory of the baby's development [24].

Due to the traumatising effects of excessive touch stimuli, modern medical care of ill newborns promotes the idea of minimal handling, which aims at reducing harmful stimulation and, consequently, giving up nursing and medical procedures that are not essential. Limitation of environmental and nursing stressors contributes to an improvement in newborns' growth and development and their physiological and behavioural stabilisation. Retardation in the development of the nervous system and cognitive functions can be observed in children who were deprived of proper natural sensory stimulation [8, 10]. Usually it is the case of preterm newborns or newborns under institutional care. Therefore, medical care of such newborns should emphasise the role of touching and the importance of physical and emotional bonds between parents and children, taking into consideration socioeconomic and cultural aspects of the family [25].

To sum up, touching may have a positive influence on newborns' development, but its excessive frequency and intensity may result in unpleasant experience and even pain.

PAIN AND ITS INFLUENCE ON NEWBORNS

Pain perception is a highly subjective phenomenon connected with physiological, biochemical, and psychological differences between organisms. Newborns are able to perceive pain stimuli, and preterm newborns may be even more susceptible to painful experience due to the immaturity of their nervous system [26-29]. The whole mechanism of pain is connected with a complex reaction manifesting itself in numerous physiological and behavioural changes in newborns [16, 29-31].

Newborns can express pain by changes in their facial expressions such as grimacing, tightening eyelids, or frowning as well as by vocal signals including screaming, crying, grunting, murmuring, sobbing, or panting [32]. Newborns' pain experience can also be observed in physiological reactions of their organism such as a faster heart-rate, increased blood pressure, lower oxygen saturation, increased respiration rate, or mydriasis. A pain stimulus is also accompanied by some hormonal changes: increased production of catecholamines, cortisol, and glucagon and decreased production of insulin, which may lead to an episode of hyperglycaemia [33-35]. Head injuries, fever, noise, and bright lighting are known to lower the pain threshold and thus intensify pain experience [32]. Untreated pain in newborns may be responsible for decreased immunity and a prolonged period of hospitalisation [36]. Prolonged exposure to pain may lead to the incidence of allodynia (pain resulting from a stimulus that does not normally cause pain in healthy people) or hyperalgesia (abnormally heightened sensitivity to pain), which exacerbates the suffering of preterm newborns whose sensitivity to pain is initially higher than in full term babies [27, 37]. The repercussions of pain experience in infancy have both immediate and far-reaching consequences. The former include an increase in postoperative complications such as endocrine disorders and intracranial bleeding, which pose a direct threat to newborns' life, being the main cause of neonatal deaths and severe complications in infancy. It should be emphasised that newborns' (especially preterm newborns') metabolic reserves are limited, which correlates with their increased susceptibility to stressors leading to autonomic destabilisation, motor agitation, and breathing disorders. Pain experienced by newborns provokes anxiety, disrupts their sleep, increases oxygen demand, and decreases appetite [29, 33]. Pain experience has a disastrous effect on newborns' brain development [38].

Although the pain experienced by newborns cannot be consciously remembered by them, it may contribute to the incidence of further complications. According to research findings, excessive pain stimulation of a developing central nervous system may lead to abnormalities in the formation of synapses, which has further somatosensory and neurobehavioural repercussions in the functioning of the whole organism. Far-reaching consequences are connected to some extent with pain memory. The memories of early painful experience may not be stored in conscious memory (external memory), but are transferred to subconsciousness (internal memory), where they are encoded in the form of structural and functional changes of in the pain system and neural ensembles [26, 39]. Abnormalities in the development of the nervous system may affect learning abilities, speech development, concentration, and behavioural disorders, which can be observed in the later stages of infancy and childhood [29, 40-43].

Therapeutic care provided by intensive care units and specialist care wards coincides with frequent pain stimulation of neonatal patients. Hospitalised newborns experience both physical pain connected with therapeutic interventions and psychological discomfort resulting from being separated from their mothers [23]. The number of invasive and, therefore, painful procedures is very high.

In the intensive neonatal care units physical pain is usually caused by procedures such as removing secretion from nasopharynx, heel puncture or venepuncture (in order to take blood samples for further examination), removing plasters, inserting a gastric probe, bladder catheterisation, intravenous cannulation and removing cannulas, including central catheters, intubation, extubation, lumbar puncture, or inserting and removing pleural drainage [32, 44]. Mechanically ventilated newborns make up the group of neonatal patients who are particularly exposed to pain because of the necessity of intubation and frequent removal of secretion from the intubation tube as well as taking samples of capillary blood for gasometry examinations [1, 45].

Pain assessment in newborns is particularly difficult due to the lack of verbal communication. The assessment of pain intensity is carried out mainly by examining infants' facial expressions, body movements, and changes in basic life parameters [33, 34]. The following scales allow pain assessment in newborns: NIPS (Neonatal Infant Pain Scale), CRIES (which assesses crying, oxygenation, vital signs, facial expressions, and sleeplessness), PIPP (Premature Infant Pain Profile), and COMFORT. However, their application in scientific research may involve the risk of the researcher's subjective assessment.

Another method of pain assessment that allows for greater objectivity is SCA (Skin Conductance Algesimeter), which indicates stimulation of the sympathetic nervous system caused by pain stimuli. The differences in skin conductance detected during the measurement result from activating sympathetic system fibres as a reaction to pain and increased production of sweat by perspiratory glands. The findings

of the research carried out by means of this method prove that, despite the application of analgesia and sedation, newborns experience severe discomfort during painful medical procedures [46].

Therefore, the primary method that prevents the pain experience in newborns is limiting the number of painful medical procedures. Insertion of an arterial line is highly recommended in the case of newborns who, because of their serious health condition, must have their blood taken regularly for medical examination [29, 47]. Apart from pharmacological methods of pain treatment in neonatal medical care, a significant role is also played by non-pharmacological ones, including breastfeeding, skin-to-skin care, delicate tucking and touching the baby, lateral recumbency with bent lower limbs, sucking a dummy, or oral administration of glucose and sucrose solutions. The aforementioned measures decrease tachycardia, shorten the time of crying, and protect newborns from fluctuations in saturation figures; however, their application is limited to slight pain, whereas in the case of acute pain they can only support analgesics [48-54]. Lateral recumbency with bent lower and upper limbs reminds the baby of a foetal position; hence its soothing effect and sense of security. An analgetic effect of administering glucose solution on oral mucosa two minutes before a painful procedure is absent if the solution is administered through a gastric probe. Therefore, this method can be safely applied only in the case of newborns with developed sucking and swallowing reactions. An optimal dose of administered glucose has not been defined yet, but it is recommended that infants born after 32 weeks of pregnancy should be given 2 ml of 30% glucose [49].

The strategy of soothing pain in newborns is based not only on non-pharmacological methods but also on the application of painkillers and sedative medicines. In order to obtain optimal effects in pain treatment, newborns should be administered medicines on a regular, not ad hoc basis. Medicines must be administered in the easiest, least painful, optimal way, and the treatment must be adjusted to an individual patient taking into account the patient's age and the type and aetiology of pain [55, 56].

CONCLUSIONS

Ill or preterm newborns are exposed to negative touch simulation and pain experience connected with diagnostic and therapeutic procedures but also with nursing care. Pain and touch may be followed by serious and irreversible changes in the newborn's development. Therefore, medical teams responsible for providing newborns with medical care should aim at reducing procedures that generate stress-inducing touch and pain and assess the intensity of pain so they could soothe it in the most efficient way. Medical teams should combine their efforts in order to provide infants with complex protection from negative consequences of pain and touch in physical, psychological, behavioural, and social spheres. Proper measures taken to reduce pain and traumatic touch experience may also allow a reduction in generating costs connected with medical care provided to neonatal patients.

Disclosure

The authors declare no conflict of interest.

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